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EXAMINER

LEWIS, BEN

ART UNIT	PAPER NUMBER
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1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/820,054

Applicant(s)

NAGAYAMA, MORI

Examiner

Ben Lewis

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

Detailed Action

1. The Applicant's amendment filed on September 14th, 2007 was received. Claims 1-5 and 18-21 were amended.
2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action (issued on June 14th, 2007).

Claim Rejections - 35 USC § 112

The claim rejections under 35 U.S.C. 112, second paragraph, on claims 1, 18 and 19 are withdrawn, because the claims have been amended.

Claim Rejections - 35 USC § 103

3. Claims 1-3, 6, 8, 10 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) in view of Brodd (U.S. Patent No. 5,522,955).

With respect to claims 1, 2 and 10, Ryu et al. disclose a rechargeable lithium battery (title) wherein, the rechargeable lithium battery according to the present invention is provided with a negative electrode containing a graphite-based active material. Boron is incorporated into the graphite-based active material as a donor.

Transition metal oxide is used for the positive electrode as an active Material (Col 2 lines 35-50).

Ryu et al. also teach that an active material slurry for the negative electrode was prepared by mixing the boron-doped graphite material identified above, polyvinylidene fluoride (PVDF) for a binder and N-methylpyrrolidone for a solvent. The weight percent ratio of the boron-doped graphite material to PVDF was 90 to 10. The slurry was coated onto a copper foil for a current collector, dried and pressed thereon to thereby prepare the negative electrode "single layer" (Col 4 lines 39-45).

With respect to amorphous carbon, Ryu et al. teach that the graphite based active material is a quasi amorphous state and a more or less disordered orientation due to a radically low crystallization degree and a tiny crystalline size (Col 2 lines 49-67).

Ryu et al. does not specifically teach wherein the single anode layer has a thickness of 30 μ m or less. However, Brodd disclose a process and apparatus for producing thin lithium coatings on electrically conductive foil (title). Brodd recognize the advantages of having an anode thickness with in the range as claimed by Applicant wherein Brodd teach that the use of very thin lithium electrodes of thickness of 2 microns or less is a particularly attractive objective since reduction in the thickness of the lithium anode layer results in a reduction of the cell size and weight, and lower material cost (Col 1 lines 46-60).

Therefore, it would have been within the skill of the ordinary artisan to incorporate fabricate an anode layer with a thickness in the range as claimed by

Applicant in order to reduce cell size and weight and lower material cost. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

With respect to claim 3, Ryu et al. teach that the carbon-based materials can be largely classified into two categories of crystalline graphite and amorphous carbon (Col 1 lines 19-25).

With respect to claims 6 and 8, Ryu et al. teach that the rechargeable lithium battery according to the present invention is provided with a negative electrode containing a graphite-based active material. Boron is incorporated into the graphite-based active material as a donor. Transition metal oxide is used for the positive electrode as an active material. A separator is interposed between the positive and negative electrodes to separate them from each other (Col 2 lines 35-45). The positive electrode can be prepared through the steps of obtaining an active material slurry by dissolving LiCoO_2 , LiNiO_2 , LiMnO_2 or LiMn_2O_4 in N-methylpyrrolidone together with poly vinylidene fluoride for a binder, and coating the active material slurry "layer" onto an aluminum foil for a positive current collector and drying it (Col 4 lines 15-25).

With respect to claim 22, Ryu et al. teach that the boron content was measured by ICP-Mass, and the surface-structure as well as the micro-structure of the negative

electrode was identified by TEM, XPS, Raman Spectroscopy and XRD analysis (See Table 1).

TABLE 1

Coating Equipment	Quantity of B ₂ O ₃ (wt %)	B content (wt %)	Atmosphere	Capacity (mAh/g)/ Charge and discharge efficiency		
				EC/DMC/ DEC	EC/EMC/ DEC	EC/DMC/ DEC/PC
Example 1 Spray-dryer	2.2	0.57	Ar	346/92.3	344/92.6	345/93.0
Example 2 Spray-dryer	4.4	1.1	Ar	338/93.7	336/93.5	339/93.8
Example 3 Agglo-master	2.2	0.47	Ar	339/89.4	336/89.7	337/90.6
Example 4 Agglo-master	2.2	0.45	Air	335/90.5	336/90.8	338/90.6
Example 5 Spray-dryer	0.6	0.16	Air	317/94.5	320/94.5	620/93.8
Example 6 Spray-dryer	1.1	0.23	Air	334/93.1	338/93.6	295/52
Example 7 Spray-dryer	1.6	0.39	Air	335/92.2	336/92.3	280/55
Example 8 Spray-dryer	2.2	0.55	Air	335/90.0	335/91.1	310/54
Example 9 Spray-dryer	4.4	1.07	Air	337/86.2	336/87.2	250/48

With respect to claim 23, this claim is a product by process claim. The baking step of claim 23, do not further limit the product of claim 1. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 698,227 USPQ 964,966 (Fed Cir. 1985).

With respect to claim 24, this claim is a product by process claim. The carbonizing step of claim 24, do not further limit the product of claim 1. MPEP 2113

states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 698,227 USPQ 964,966 (Fed Cir. 1985).

With respect to claims 23 and 24, Ryu et al. teach that a boron-based compound is mixed with pitch. The mixture is heat-treated at about 450.degree. C. to obtain a coke type material. Alternatively, a boron-based compound is first mixed with pitch or resin and the mixture is then uniformly re-mixed with pitch coke that is obtained by cocking pitch. The resulting material is carbonized at temperatures ranging from 1000.degree. C. to 1700.degree. C. The carbonized material is then graphitized at temperatures ranging from 2000.degree. C. to 3000.degree. C. to thereby obtain a boron-doped active material (Col 3 lines 45-55).

4. Claims 4, 5, 12, 14, 16 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) in view of Brodd (U.S. Patent No. 5,522,955).

With respect to claims 4 and 16, Ryu et al. disclose a rechargeable lithium battery (title) wherein, the rechargeable lithium battery according to the present

invention is provided with a negative electrode containing a graphite-based active material. Boron is incorporated into the graphite-based active material as a donor. Transition metal oxide is used for the positive electrode as an active Material (Col 2 lines 35-50).

Ryu et al. also teach that an active material slurry for the negative electrode was prepared by mixing the boron-doped graphite material identified above, polyvinylidene fluoride (PVDF) for a binder and N-methylpyrrolidone for a solvent. The weight percent ratio of the boron-doped graphite material to PVDF was 90 to 10. The slurry was coated onto a copper foil for a current collector, dried and pressed thereon to thereby prepare the negative electrode "single layer" (Col 4 lines 39-45).

With respect to amorphous carbon, Ryu et al. teach that the graphite based active material is a quasi amorphous state and a more or less disordered orientation due to a radically low crystallization degree and a tiny crystalline size (Col 2 lines 49-67).

Ryu et al. does not specifically teach wherein the single anode layer has a thickness of has a thickness less than $1\mu\text{m}$. However, Brodd disclose a process and apparatus for producing thin lithium coatings on electrically conductive foil (title). Brodd recognize the advantages of having an anode thickness with in the range as claimed by Applicant wherein Brodd teach that the use of very thin lithium electrodes of thickness of 2 microns or less is a particularly attractive objective since reduction in the thickness of the lithium anode layer results in a reduction of the cell size and weight, and lower material cost (Col 1 lines 46-60).

Therefore, it would have been within the skill of the ordinary artisan to incorporate fabricate an anode layer with a thickness in the range as claimed by Applicant in order to reduce cell size and weight and lower material cost. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

With respect to claim 5, Ryu et al. teach that a carbonaceous material such as coke or mesophase pitch-based carbon fiber is mixed with the boron-based compound solution to make a mixed solution. The mixed solution is then processed by using a spray-dryer or an agglomerator such that the boron-based compound can be uniformly coated on the surface of the carbonaceous material. Thereafter, the carbonaceous material coated with the boron-based compound is graphitized "graphite" at temperatures ranging from 2000 °C. to 3000 °C for 2 to 20 hours under an argon or air atmosphere to thereby obtain the desired negative electrode active material (Col 3 lines 30-43).

With respect to claims 12 and 14, Ryu et al. teach that the rechargeable lithium battery according to the present invention is provided with a negative electrode containing a graphite-based active material. Boron is incorporated into the graphite-based active material as a donor. Transition metal oxide is used for the positive

electrode as an active material. A separator is interposed between the positive and negative electrodes to separate them from each other (Col 2 lines 35-45). The positive electrode can be prepared through the steps of obtaining an active material slurry by dissolving LiCoO_2 , LiNiO_2 , LiMnO_2 or LiMn_2O_4 in N-methylpyrrolidone together with poly vinylidene fluoride for a binder, and coating the active material slurry "layer" onto an aluminum foil for a positive current collector and drying it (Col 4 lines 15-25).

With respect to claim 21, Ryu et al. teach that an active material slurry for the negative electrode was prepared by mixing the boron-doped graphite material identified above, polyvinylidene fluoride (PVDF) for a binder and N-methylpyrrolidone for a solvent (Col 4 lines 35-45).

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 6 above and further in view of Hossain (U.S. Patent No. 5,595,839).

With respect to claim 7, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 3 above. Ryu et al as modified by Brodd do not specifically teach wherein the lithium ion secondary battery has a structure including a plurality of bipolar electrodes serially stacked by interposing electrolyte therebetween. However, Hossain teach a bipolar lithium-ion rechargeable battery wherein the rechargeable, lithium-ion battery comprises a plurality of individual electrochemical cells

having positive and negative electrodes disposed in opposite face-to-face arrangement with a porous separator containing electrolyte therebetween, and wherein the positive and negative electrodes of adjacent cells are disposed in contact respectively with opposite sides of a common current-collecting element forming a unitary bipolar structure (Col 2 lines 20-40). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the bipolar structure of Hossain into the lithium-ion battery of Ryu et al as modified by Brodd because Hossain teach that it has been surprisingly discovered that a significant improvement in high rate performance, beyond what might normally be expected, is possible with the bipolar design of the present invention (Col 4 lines 40-55).

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 6 above and further in view of Izuchi et al. (U.S. Patent No. 6,902,848 B1).

With respect to claim 9, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 3 above. Ryu et al as modified by Brodd do not specifically teach wherein the electrolyte comprises polymer used in a gel form or solid form. However, Izuchi et al. discloses a lithium battery including a gel electrolyte wherein an object of the present invention is to provide a lithium battery which exhibits a gel electrolyte ion conductivity kept at a high level and allows smooth migration of lithium ion in the gel electrolyte without the necessity of any special production step to

keep its performance at a sufficient level even during high rate discharge and have a prolonged life and a stable battery performance (Col 2 lines 10-21). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the gel electrolyte of Izuchi et al. into the lithium-ion battery of Ryu et al as modified by Brodd because Izuchi et al. teach that since the concentration of lithium salt in the gel electrolyte is high, polarization accompanying the migration of lithium ion can be relaxed during high rate discharge, providing a good charge and discharge performance (Col 4 lines 24-30).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 6 above and further in view of Nemoto et al. (U.S. Patent No. 6,368,750 B1).

With respect to claim 11, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 3 above. Ryu et al as modified by Brodd do not specifically teach wherein the assembled battery is used for a vehicle. However, Nemoto et al. discloses a lithium secondary battery wherein the present invention relates to, among secondary batteries to be used as an operational power source for portable electronic equipment, or as a motor driving battery for an electric vehicle or a hybrid electric vehicle, etc., a lithium secondary battery which has small internal resistance and has good charge-discharge cycle characteristics, with a lithium transition metal compound being used as a positive active material (Col 1 lines 5-15). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the gel electrolyte Nemoto et al. into the lithium-ion battery of Ryu et al as modified by Brodd

because Nemoto et al. teach that such a battery is generally called a lithium secondary battery or a lithium ion battery, and since they are provided with larger energy density as well as with higher unit cell voltage of approximately 4V, attention is being paid to these batteries not only for the aforementioned electronic equipment but also as a motor driving power source for an electric vehicle or a hybrid electric vehicle (Col 1 lines 24-35).

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 12 above and further in view of Hossain (U.S. Patent No. 5,595,839).

With respect to claim 13, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 4 above. Ryu et al as modified by Brodd do not specifically teach wherein the lithium ion secondary battery has a structure including a plurality of bipolar electrodes serially stacked by interposing electrolyte therebetween. However, Hossain teach a bipolar lithium-ion rechargeable battery wherein the rechargeable, lithium-ion battery comprises a plurality of individual electrochemical cells having positive and negative electrodes disposed in opposite face-to-face arrangement with a porous separator containing electrolyte therebetween, and wherein the positive and negative electrodes of adjacent cells are disposed in contact respectively with opposite sides of a common current-collecting element forming a unitary bipolar structure (Col 2 lines 20-40). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the bipolar structure of Hossain into the lithium-ion battery

of Ryu et al as modified by Brodd because Hossain teach that it has been surprisingly discovered that a significant improvement in high rate performance, beyond what might normally be expected, is possible with the bipolar design of the present invention (Col 4 lines 40-55).

9. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 12 above and further in view of Izuchi et al. (U.S. Patent No. 6,902,848 B1).

With respect to claim 15, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 4 above. Ryu et al as modified by Brodd do not specifically teach wherein the electrolyte comprises polymer used in a gel form or solid form. However, Izuchi et al. discloses a lithium battery including a gel electrolyte wherein an object of the present invention is to provide a lithium battery which exhibits a gel electrolyte ion conductivity kept at a high level and allows smooth migration of lithium ion in the gel electrolyte without the necessity of any special production step to keep its performance at a sufficient level even during high rate discharge and have a prolonged life and a stable battery performance (Col 2 lines 10-21). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the gel electrolyte of Izuchi et al. into the lithium-ion battery of Ryu et al as modified by Brodd because Izuchi et al. teach that since the concentration of lithium salt in the gel electrolyte is high, polarization accompanying the migration of lithium ion can be relaxed during high rate discharge, providing a good charge and discharge performance (Col 4 lines 24-30).

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 16 above and further in view of Nemoto et al. (U.S. Patent No. 6,368,750 B1).

With respect to claim 17, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 4 above. Ryu et al as modified by Brodd do not specifically teach wherein the assembled battery is used for a vehicle. However, Nemoto et al. discloses a lithium secondary battery wherein the present invention relates to, among secondary batteries to be used as an operational power source for portable electronic equipment, or as a motor driving battery for an electric vehicle or a hybrid electric vehicle, etc., a lithium secondary battery which has small internal resistance and has good charge-discharge cycle characteristics, with a lithium transition metal compound being used as a positive active material (Col 1 lines 5-15). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the gel electrolyte Nemoto et al. into the lithium-ion battery of Ryu et al as modified by Brodd because Nemoto et al. teach that such a battery is generally called a lithium secondary battery or a lithium ion battery, and since they are provided with larger energy density as well as with higher unit cell voltage of approximately 4V, attention is being paid to these batteries not only for the aforementioned electronic equipment but also as a motor driving power source for an electric vehicle or a hybrid electric vehicle (Col 1 lines 24-35).

11. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 1 above and further in view of Matsubara et al. (U.S. Patent No. 6,641,955 B1).

With respect to claim 18, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 3 above. Ryu et al as modified by Brodd do not specifically teach wherein the anode material comprises an oxide of other metal. However, Matsubara et al. disclose anode material for lithium battery (title) wherein the method for producing the anode material for the lithium secondary battery of this invention comprises the steps of: coating a carboxylic metal salt on the surface of a carbon material by mixing carboxylic metal salt and carbon material; transforming the carboxylic metal salt into an amorphous metal compound by heating the carbon material having the carboxylic metal salt, and forming a carbon material coated on one part by the metal compound (Col 3 lines 35-50). Matsubara et al. also teach that a SnO_2 and/or SnO tin compound comprise(s) Sn easily capable of forming an alloy with lithium, and have(s) higher charge/discharge capacity than carbon material. The single use of this tin compound can form an anode material having high charge/discharge capacity, but if this tin compound is coated with carbon material, an anode material having the merits of both the tin compound and the carbon material can be formed (Col 4 lines 55-67). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the tin oxide of Matsubara et al. into the anode of Ryu et al as modified by Brodd because Matsubara et al. teach that an SnO_2 and/or

SnO tin compound comprise(s) Sn easily capable of forming an alloy with lithium, and have(s) higher charge/discharge capacity than carbon material. (Col 4 lines 55-67).

12. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 4 above and further in view of Matsubara et al. (U.S. Patent No. 6,641,955 B1).

With respect to claim 18, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 4 above. Ryu et al as modified by Brodd do not specifically teach wherein the anode material comprises an oxide of other metal. However, Matsubara et al. disclose anode material for lithium battery (title) wherein the method for producing the anode material for the lithium secondary battery of this invention comprises the steps of: coating a carboxylic metal salt on the surface of a carbon material by mixing carboxylic metal salt and carbon material; transforming the carboxylic metal salt into an amorphous metal compound by heating the carbon material having the carboxylic metal salt, and forming a carbon material coated on one part by the metal compound (Col 3 lines 35-50). Matsubara et al. also teach that an SnO₂ and/or SnO tin compound comprise(s) Sn easily capable of forming an alloy with lithium, and have(s) higher charge/discharge capacity than carbon material. The single use of this tin compound can form an anode material having high charge/discharge capacity, but if this tin compound is coated with carbon material, an anode material having the merits of both the tin compound and the carbon material can be formed (Col 4 lines 55-67). Therefore it would have been obvious to one of ordinary skill in the art at the time

the invention was made to incorporate the tin oxide of Matsubara et al. into the anode of Ryu et al as modified by Brodd because Matsubara et al. teach that an SnO_2 and/or SnO tin compound comprise(s) Sn easily capable of forming an alloy with lithium, and have(s) higher charge/discharge capacity than carbon material. (Col 4 lines 55-67).

13. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ryu et al. (U.S. Patent No. 6,521,380 B1) and Brodd (U.S. Patent No. 5,522,955) as applied to claim 1 above and further in view of Ishida et al. (U.S. Pub. No. 2002/0006552 A1).

With respect to claim 20, Ryu et al as modified by Brodd disclose an anode for secondary battery in paragraph 3 above Ryu et al as modified by Brodd do not specifically teach wherein the anode material comprises a polymer electrolyte. However, Ishida et al. disclose a lithium secondary battery (title) wherein the invention relates to a lithium secondary battery containing polymer electrolyte in at least one of positive electrode and negative electrode. The solid electrolyte lacks fluidity, and hence hardly permeates into the electrode, and therefore by preliminarily containing electrolyte in the electrode to obtain a compound electrode, so that the ion conductivity is enhanced (Paragraph 0028). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the addition of polymer electrolyte to the anode of Ishida et al. into the anode of Ryu et al as modified by Brodd because Ishida et al. teach that by preliminarily containing electrolyte in the electrode to obtain a compound electrode, so that the ion conductivity is enhanced (Paragraph 0028)

Response to Arguments

14. Applicant's arguments filed on September 14th, 2007 have been fully considered but they are not persuasive.

Applicant's principal arguments are

(a) The combination of Ryu et al. and Brodd does not suggest the claimed anode electrode or lithium ion secondary battery because Ryu et al. and Brodd do not suggest the anode material comprising boron-added amorphous carbon containing at least amorphous carbon and boron, as required by claim 1, and the anode material comprising carbonaceous material containing amorphous carbon, as required by claim 4.

(b) Further, Ryu et al. disclose that "boron doped graphite-based active material is formed with a core having a crystalline-graphitic structure and a carbon surface having a turbostratic structure The turbostratic structure is characterized by a quasi-amorphous state and a more or less disordered orientation due to a radically low crystallization degree and a tiny crystalline size" (column 2, lines 54-65). However, the quasi-amorphous state of graphite is different from amorphous carbon. The quasi-

amorphous state of graphite is a state in which an orientation of crystal planes of the graphenes is disordered (see attached Exhibit 1). In contrast, amorphous carbon is defined as "carbon material without long-range crystalline order. Short range order exists, but with deviations of the interatomic distances and/or interbonding angles with respect to the graphite lattice as well as to the diamond lattice" (see attached Exhibit 2 - printout of IUPAC Compendium of Chemical Terminology for amorphous carbon). For the Examiner's convenience, a copy of the printout of IUPAC Compendium of Chemical Terminology for graphite is also attached (see Exhibit 3). As is well-known, graphite has long range order. In view of the differences between graphite, quasi-amorphous, and amorphous carbon, and the express teachings of Ryu et al., it is readily apparent that Ryu et al. do not suggest the anode material comprising boron-added amorphous carbon containing at least amorphous carbon and boron, as required by claim 1, and the anode material comprising carbonaceous material containing amorphous carbon, as required by claim 4.

In response to Applicant's arguments, please consider the following comments.

(a) and (b) With respect to amorphous carbon, Ryu et al. teach that the graphite based active material is a quasi amorphous state and a more or less disordered orientation due to a radically low crystallization degree and a tiny crystalline size (Col 2 lines 49-67).

Applicant states that "amorphous carbon is defined as "carbon material without long-range crystalline order. Short range order exists, but with deviations of the interatomic distances and/or interbonding angles with respect to the graphite lattice as well as to the diamond lattice" (see attached Exhibit 2 - printout of IUPAC Compendium of Chemical Terminology for amorphous carbon)." Examiner notes that since Ryu et al. teach that the quasi amorphous state has a radically low crystallization degree and a tiny crystalline size then the definition of amorphous carbon encompasses quasi amorphous carbon as disclosed by Ryu et al. since Applicant states that amorphous carbon is devined as carbon material without long range crystalline order.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Ben Lewis


PATRICK JOSEPH RYAN
SUPERVISORY PATENT EXAMINER

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Patent Examiner
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